



## Green manufacturing – Environmental Sustainability in Production

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## **Green manufacturing – Environmental Sustainability in Production**

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Sustainability awareness in industry is rising, and manufacturers are reporting their sustainability performance to several non-governmental organizations like Carbon Disclosure Project and Dow Jones Sustainability Index. External stakeholders are using those to evaluate the worthiness of investments. Meanwhile manufacturers and the European Commission see environmental sustainability as a competitive edge and developed a roadmap for the factories of the future [1]. In reality manufacturers are focusing on eco-efficiency of their products due to political and legal frameworks (e.g. eco-labels for white goods and specific emission targets for cars). But it can be questioned if this leads to environmental sustainability. Recently evolved terms like eco-effectiveness and absolute sustainability are expanding the system by considering the whole life cycle of products, companies or services [2],[3]. These approaches are recognizing e.g. burden-shifting between life cycle stages and rebound-effects due to more sales. Also the International Organization for Standardization includes the life cycle approach as a prerequisite for certification in the updated ISO 14001 [4].

To minimize environmental impacts in production, companies are planning to use more renewable energy in first instance. The integration of renewable energy needs new components, and this means that manufacturing system planning gets more complex. To avoid sub-optimization, a framework to integrate sustainability into manufacturing has been derived from industry projects. Since companies are deterred by possible high implementation cost and time constraints [5], our approach employ already existing planning parameters so the existing decision-making process is not compromised.

A Life Cycle Assessment model for production lines was developed and applied which analyze the performance based on widely used parameters. A linkage to those parameters and life cycle databases has been established to predict environmental impact of the process, infrastructure and overhead consumption holistically. By this approach sub-optimization can be avoided and the decision making process in production planning is supported.

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- [4] ISO 14001, "ISO 14001 Environmental Management Systems Revision," 2015.
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